

REMARKS

Pending Claims

Upon entry of the foregoing amendment, 27 claims are pending in the application. Of the pending claims, 6 claims are independent. These numbers include the claims that have been withdrawn by the Examiner. Claim 25 is canceled and new claims 26-29 are entered.

Claim Rejections under 35 USC § 102(b)

The Examiner has rejected claims 1, 14, 15, 17, 19, and 23-26 under 35 USC § 102(b) as being anticipated by Sickles (US Pat. 4,347,984). However, in view of the amendments to claims 1 and 14, this rejection is rendered moot. To summarize what is explained in detail below, claims 1 and 14 as amended recite that the nozzle and electrode are separated from one another by an “axial distance”. In contrast Sickles teaches the axial co-alignment of the nozzle and electrode, such that droplets are charged as they are atomized, and teaches away from placing the electrode in a position forward of the nozzle.

Claims 1 and 14 have been amended to recite “providing a grounded nozzle and an electrode separated by a predetermined axial distance”. Thus this amendment clearly distinguishes these claims from the cited Sickles reference, wherein the electrode 15 (in the form of a conductive film or coating on the inside of cylinder 14) surrounds nozzle 3 and is therefore not separated from nozzle 3 by any axial distance.

This amendment in fact clarifies and sharpens the claiming of a feature that is already present in claims 1 and 14. Claims 1 and 14, prior to amendment, recite “ejecting a liquid or powder from said nozzle towards said electrode”. By stating that the liquid is ejected “towards” the electrode, this emphasizes that the electrode is separated by an axial distance.

There is ample support for this amendment in the originally-filed specification and drawings. All of the figures (drawings as well as photographs) of the originally-filed application depict the electrode as being downstream of the nozzle, i.e. separated by an axial distance. Furthermore, Figures 2 and 3 and the accompanying text in paragraph [0036] of the published application (Pub. No. US 2004/0050946) discuss the importance of matching the shape of the electrode to the pattern of spray, which would only be relevant if the electrode were positioned at an axial distance from the electrode in the direction of the spray. In addition, the text also mentions in paragraph [0038] a preferred embodiment wherein “the electrodes 55, 57 are positioned very close to a high pressure jet of particles 54 that the particles can pick up charges from the electrodes by direct or indirect contact and still have sufficient momentum to break away from the electrodes.” This latter embodiment only makes sense if the electrode is separated from the nozzle by an axial distance, as opposed to a radial distance.

Furthermore, paragraph [0040] of the published application (Pub. No. US 2004/0050946) discusses tests that were performed to determine the optimal predetermined axial distance between the nozzle and the electrode, which was found to be 1.1 inches:

Tests were performed to determine the optimized critical dimensions and parameters of the sprayer components. Spray efficiency was measured for various values of electrode to nozzle spacing, 0.3, 0.6, 0.9, 1.2, and 1.5 inches. The significant improvement with a broad peak was obtained for the range of 0.8 to

1.4 inches. In a preferred embodiment, the electrode is positioned 1.1 inches from the nozzle, which has a 0.018 inch diameter orifice. ... The electrode opening was varied for other tests with the width ranging from 0.2 to 1.0 inches, while the electrode to nozzle spacing was 1.1 inches. High spray efficiency was achieved for a width in the range of 0.4 to 0.8 inches. In a preferred embodiment, the best results are obtained for a width of 0.6 inches.

Pub. No. US 2004/0050946 (Emphasis added), ¶ [0040].

That the electrode is separated from the nozzle in an axial direction, in addition to radially, is indicated by the fact that this paragraph also discusses “other tests” performed with different electrode opening widths, i.e. the radial separation distance, at a fixed electrode to nozzle spacing of 1.1 inches. Clearly, then, the term “electrode to nozzle spacing” refers to separation by an axial distance, since the radial separation distance was treated as a separate issue. Paragraphs [0037] and [0038] also address optimal distance between nozzle and electrode, and again it is clear that this distance is in the axial direction. For example, in several places in paragraph [0037] reference is made to the “electrode position and width of its opening”, with the position and width being separate factors. Once again, since the “width” of the electrode clearly refers to the radial separation distance, it is equally clear that the “position” refers to the axial separation distance between the electrode and the nozzle.

The claimed separation of the nozzle from the electrode by a predetermined axial distance is an important feature of the invention, as revealed by test results reported on in the originally-filed application. Pub. No. US 2004/0050946, ¶ [0040]. Nonetheless, even at the closest of the distances tested the electrode was placed 0.3 inches from the nozzle in the axial direction, but not aligned with the nozzle as in Sickles. In other parts of the application there are discussions of optimizations of particle or droplet charging based on the width and shape of the electrode

relative to the degree of atomization of the droplets, further indicating that the electrode is meant to be placed at an axial distance from the nozzle. Also, in one embodiment of the present invention it is suggested that some fraction of the droplets might become charged by making direct contact with the electrode.

In paragraph [0036] of the published application it is noted that “[t]he profile of the electrode should cover the complete periphery of the sprayed patterns of the particles to maximize the electrostatic charges.” This statement shows that the electrode is separated by an axial distance since (1) it assumes that the sprayed material is already separated into particles or droplets by the time they encounter the electrode, which would not be the case if the electrode were co-aligned with the nozzle; and (2) it also indicates that the electrode is separated from the nozzle by an axial distance because matching the shape of the electrode to the shape of the spray would not be relevant if the electrode were co-aligned with the nozzle. Indeed, Sickles, whose electrode is co-aligned with the nozzle in the axial direction, states that “neither the size nor the radial location of the inductive charging means relative to the air and liquid discharge ports are critical” (col. 7, lines 62-64), presumably because the droplets are charged as they emerge from the nozzle and not after they have formed a spray pattern.

Finally, the phrase “*separated* by a predetermined axial distance” as used in amended claims 1 and 14 makes it clear that the electrode does not overlap with the nozzle, as is the case for the sprayer disclosed in Stickles.

In contrast to the invention of the present application, it is clear that the nozzle and electrode disclosed in Stickles are not separated from one another axially. For example, Stickles

discusses in several places that the droplets are charged simultaneously with their emergence from the nozzle (col. 6, lines 7-9 and 61-66), indicating that the electrode is axially co-aligned with the nozzle.

Most importantly, Stickles teaches away from the idea of positioning the electrode at an axial distance from the nozzle and ejecting the liquid in the direction of the electrode. Stickles initially states that the relative positioning of the nozzle and electrode is "not critical" but then goes on to say that placing the electrode forward of the nozzle is "not generally ... desirable" due to a tendency to accumulate liquid or fluid particles on the charging means. Col. 7, lines 43-61. In contrast to these statements of Stickles, it is clear from the present application that for the claimed invention the axial separation distance of the nozzle and electrode is in fact critical and that placing the electrode forward of the nozzle is desirable, in that a higher charging efficiency can be achieved under the conditions described when the nozzle is separated by an axial distance from the electrode.

It is unclear which element of the Stickles disclosure is supposed to correspond to the "grounded conductive cover" element of claim 17. The only element of the Stickles disclosure that might correspond to this element, i.e. which has "an opening that allows a directed spray to exit", is the tube 14. However, as Stickles makes clear, this tube 14 is made of a dielectric, i.e. non-conducting, material (col. 3, line 56; col. 7, line 1; col. 7, line 8). Thus since the tube 14 is dielectric, or non-conducting, it is therefore not a "grounded conductive cover." Therefore, the Examiner has failed to make a *prima facie* case for rejection of claim 17 and as such Applicant respectfully requests that this rejection be withdrawn.

Claim Rejections under 35 USC § 103(a)

The Examiner has rejected claim 20 under 35 USC § 103(a) as being unpatentable over Sickles. However, as the Examiner has failed to make a *prima facie* case for rejection under section 103, Applicant respectfully requests that this rejection be withdrawn. Specifically, the Examiner has failed to cite any teaching, suggestion, or motivation in the prior art or in the knowledge of one of ordinary skill in the art that would lead to the given claim limitation.

New Claims

Entered herewith are new claims 26-29, which claim varying numerical values for the “predetermined axial distance.” These values are well supported by the originally-filed application, particularly paragraph [0040] quoted above, and as such no new matter is added.

Allowable Subject Matter

Claims 21 and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form. Applicant gratefully acknowledges the Examiner’s recognition of the allowability of claims 21 and 22. However, in light of the arguments set forth herein, Applicant submits that all of the claims are allowable over the cited art of record and thus there is no need to rewrite claims 21 and 22 per the Examiner’s instructions.

Conclusion


Applicant respectfully submits that the independent claims are allowable over the prior art of record, including the cited references. For similar reasons, and for the additional reasons set forth above, Applicant urge that the dependent claims are also allowable.

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance.

If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,

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